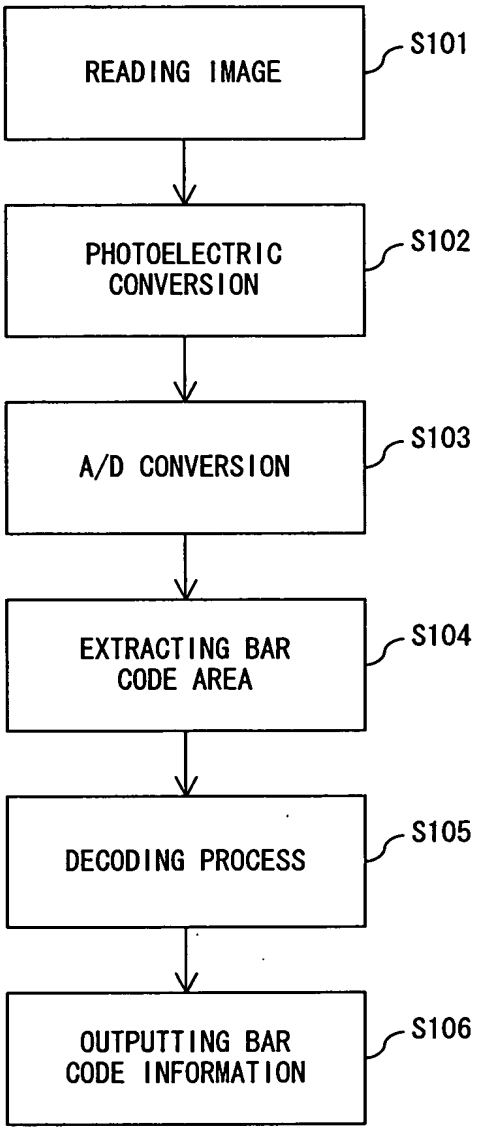

READING IMAGE
S101
PHOTOELECTRIC CONVERSION
S102
A/D CONVERSION
S103
EXTRACTING BAR CODE AREA
S104
DECODING PROCESS
S105
OUTPUTTING BAR CODE INFORMATION
S106

FIG. 1A

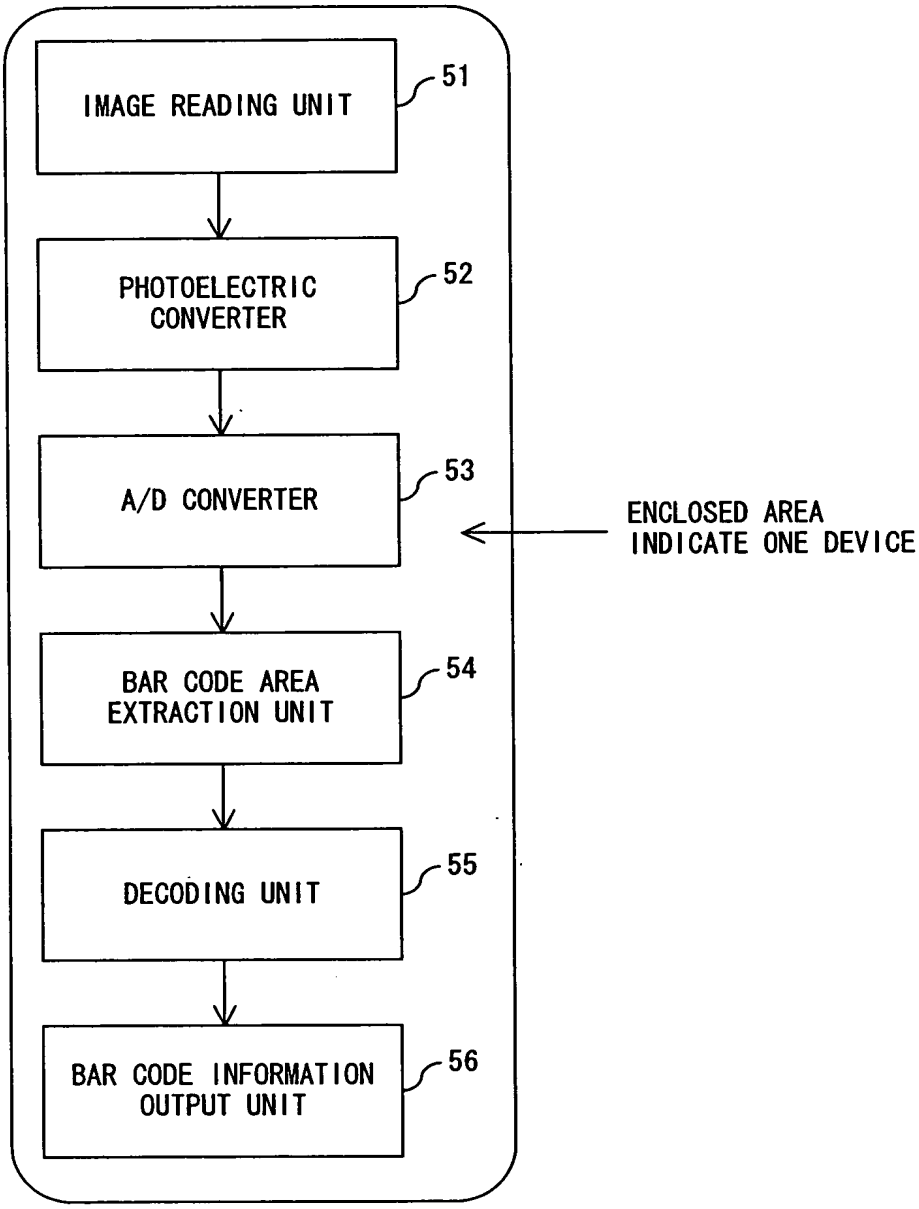


IMAGE READING UNIT
51
PHOTOELECTRIC CONVERTER
52
A/D CONVERTER
53
ENCLOSED AREA INDICATE ONE DEVICE
BAR CODE AREA EXTRACTION UNIT
54
DECODING UNIT
55
BAR CODE INFORMATION OUTPUT UNIT
56

FIG. 1B

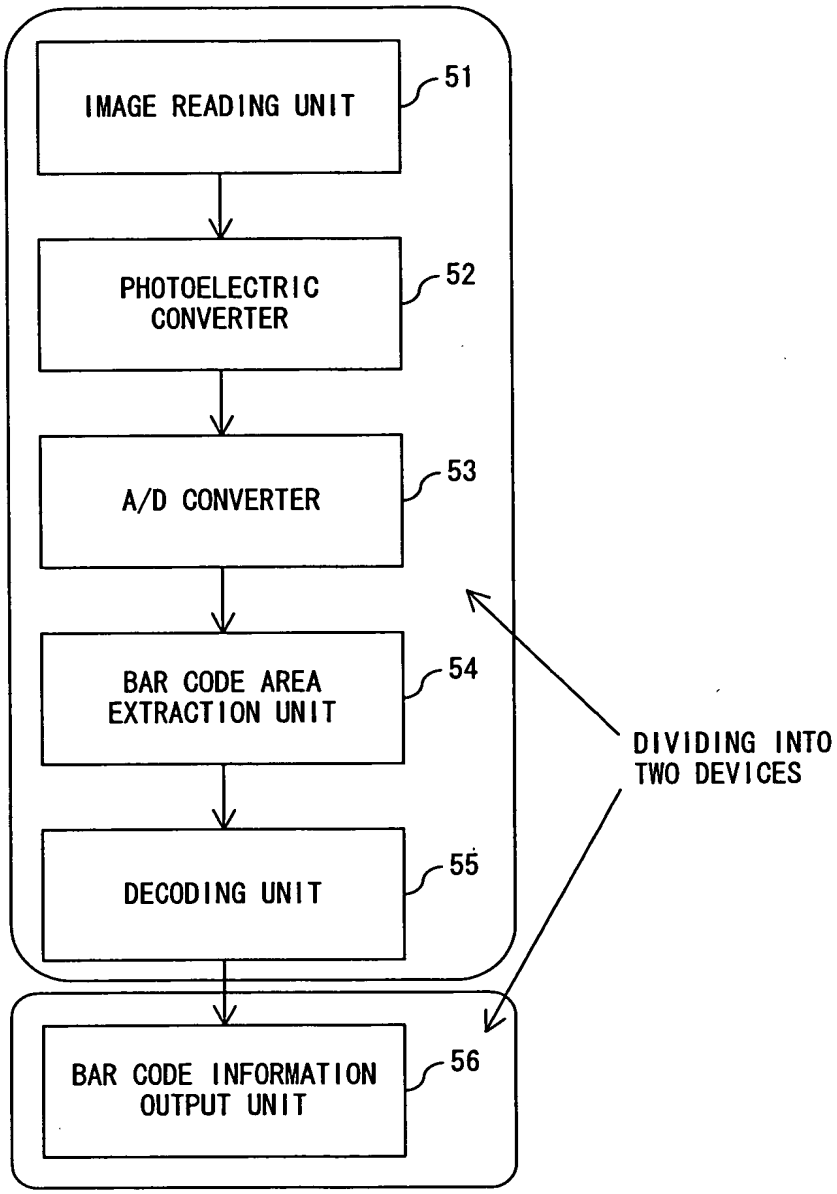


IMAGE READING UNIT
51
PHOTOELECTRIC CONVERTER
52
A/D CONVERTER
53
BAR CODE AREA EXTRACTION UNIT
54
DECODING UNIT
55
BAR CODE INFORMATION OUTPUT UNIT
56
DIVIDING INTO TWO DEVICES

FIG. 1C

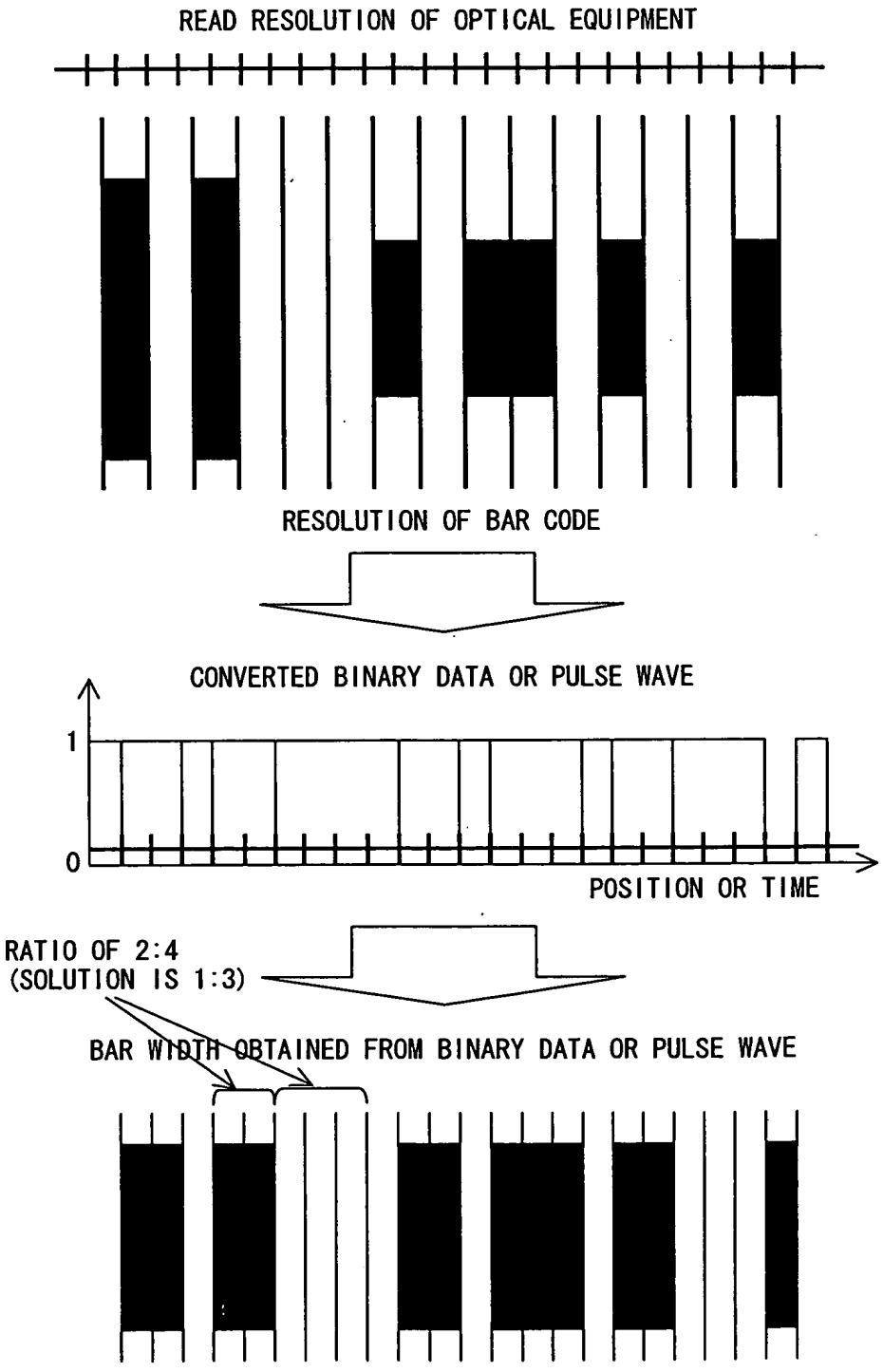

READ RESOLUTION OF OPTICAL EQUIPMENT
RESOLUTION OF BAR CODE
CONVERTED BINARY DATA OR PULSE WAVE
1
0
POSITION OR TIME
RATIO OF 2:4
(SOLUTION IS 1:3)
BAR WIDTH OBTAINED FROM BINARY DATA OR PULSE WAVE

FIG. 1D

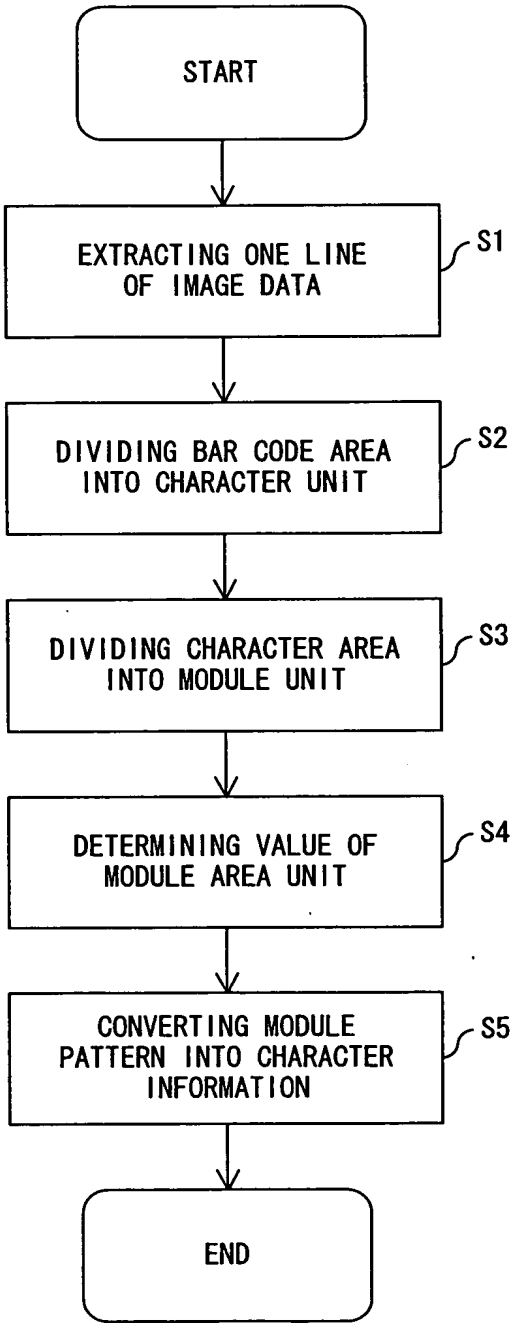

START
EXTRACTING ONE LINE OF IMAGE DATA
S1
DIVIDING BAR CODE AREA INTO CHARACTER UNIT
S2
DIVIDING CHARACTER AREA INTO MODULE UNIT
S3
DETERMINING VALUE OF MODULE AREA UNIT
S4
CONVERTING MODULE PATTERN INTO CHARACTER INFORMATION
S5
END

FIG. 1E

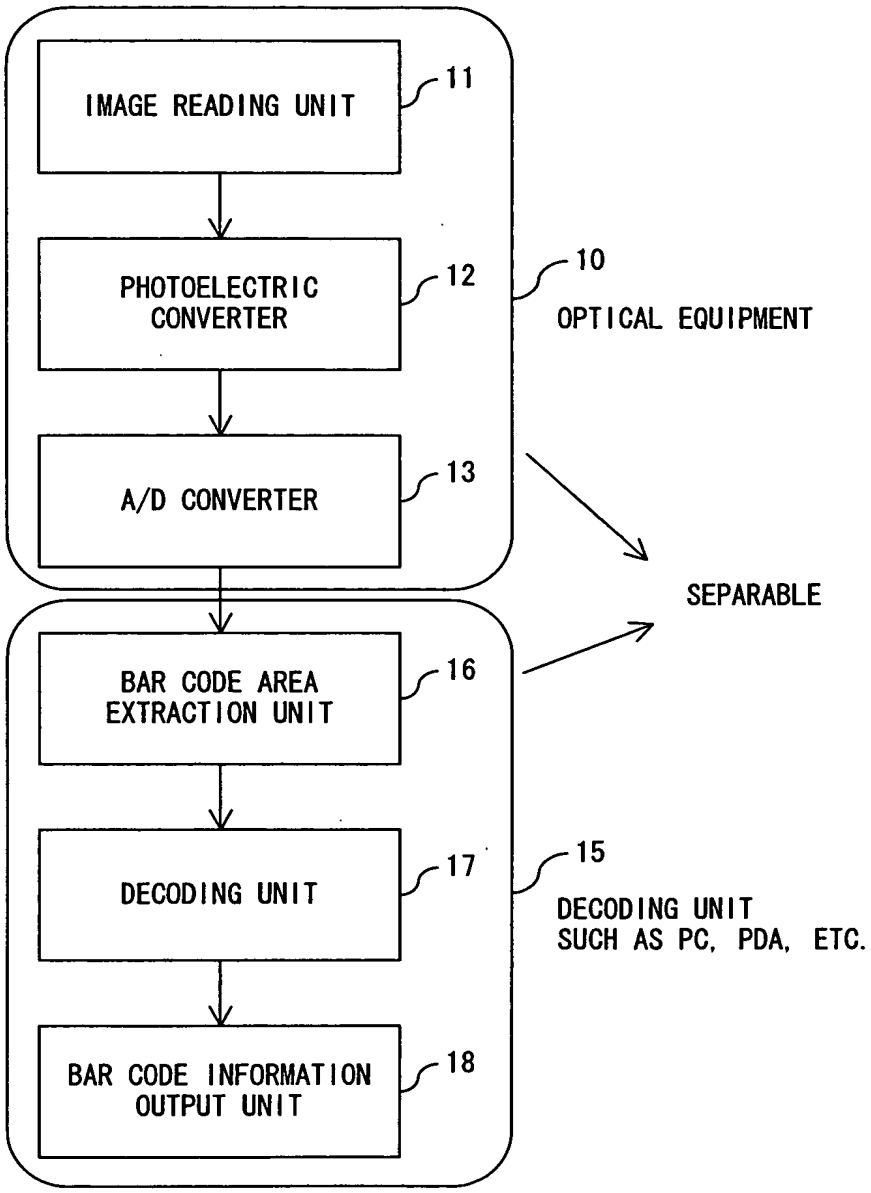


IMAGE READING UNIT
11
PHOTOELECTRIC CONVERTER
12
A/D CONVERTER
13
10
OPTICAL EQUIPMENT
SEPARABLE
BAR CODE AREA EXTRACTION UNIT
16
DECODING UNIT
17
BAR CODE INFORMATION OUTPUT UNIT
18
15
DECODING UNIT SUCH AS PC, PDA, ETC.

FIG. 2

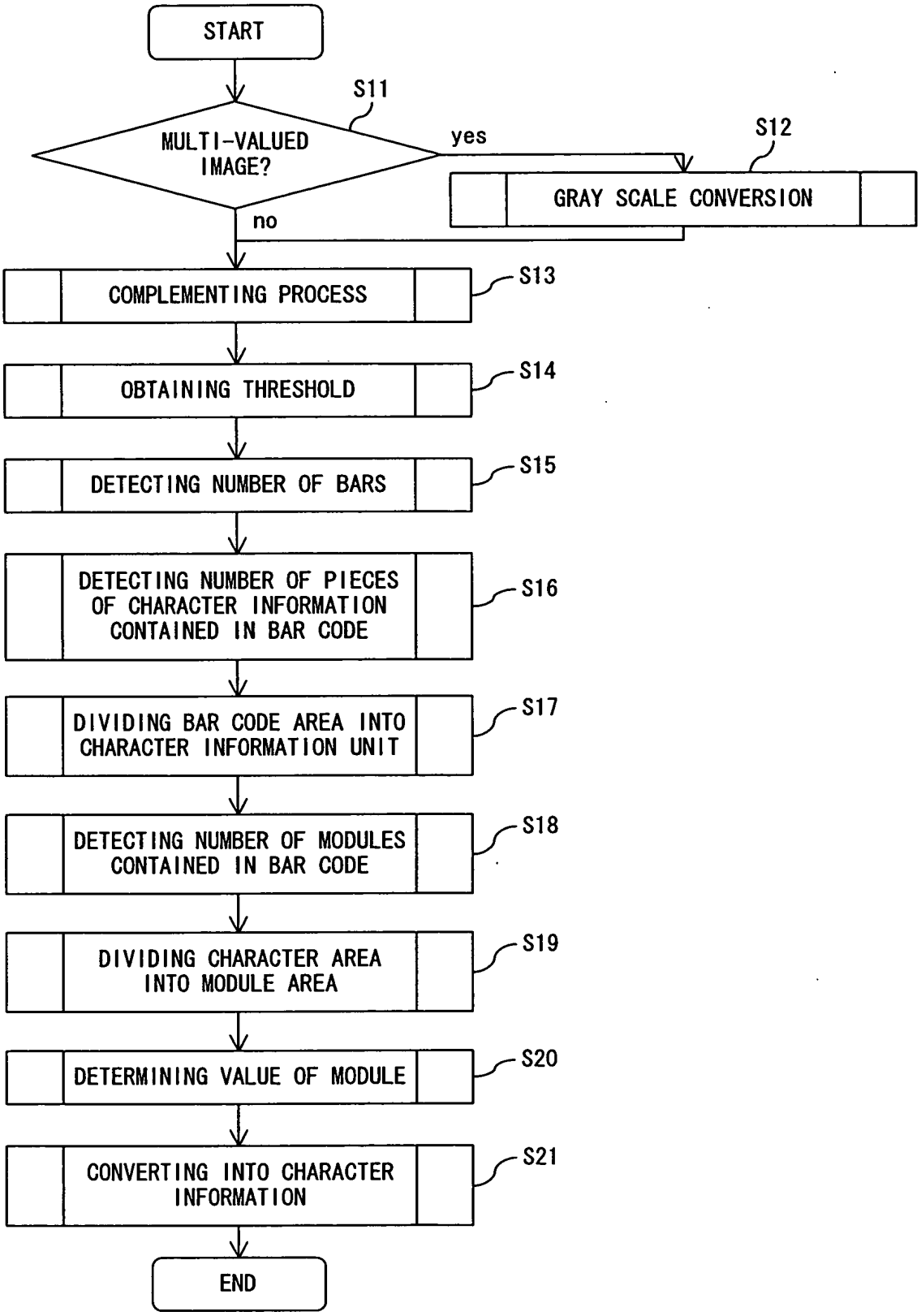

START
S11
MULTI-VALUED IMAGE?
yes
S12
GRAY SCALE CONVERSION
no
COMPLEMENTING PROCESS
S13
OBTAINING THRESHOLD
S14
DETECTING NUMBER OF BARS
S15
DETECTING NUMBER OF PIECES OF CHARACTER INFORMATION CONTAINED IN BAR CODE
S16
DIVIDING BAR CODE AREA INTO CHARACTER INFORMATION UNIT
S17
DETECTING NUMBER OF MODULES CONTAINED IN BAR CODE
S18
DIVIDING CHARACTER AREA INTO MODULE AREA
S19
DETERMINING VALUE OF MODULE
S20
CONVERTING INTO CHARACTER INFORMATION
S21
END

FIG. 3

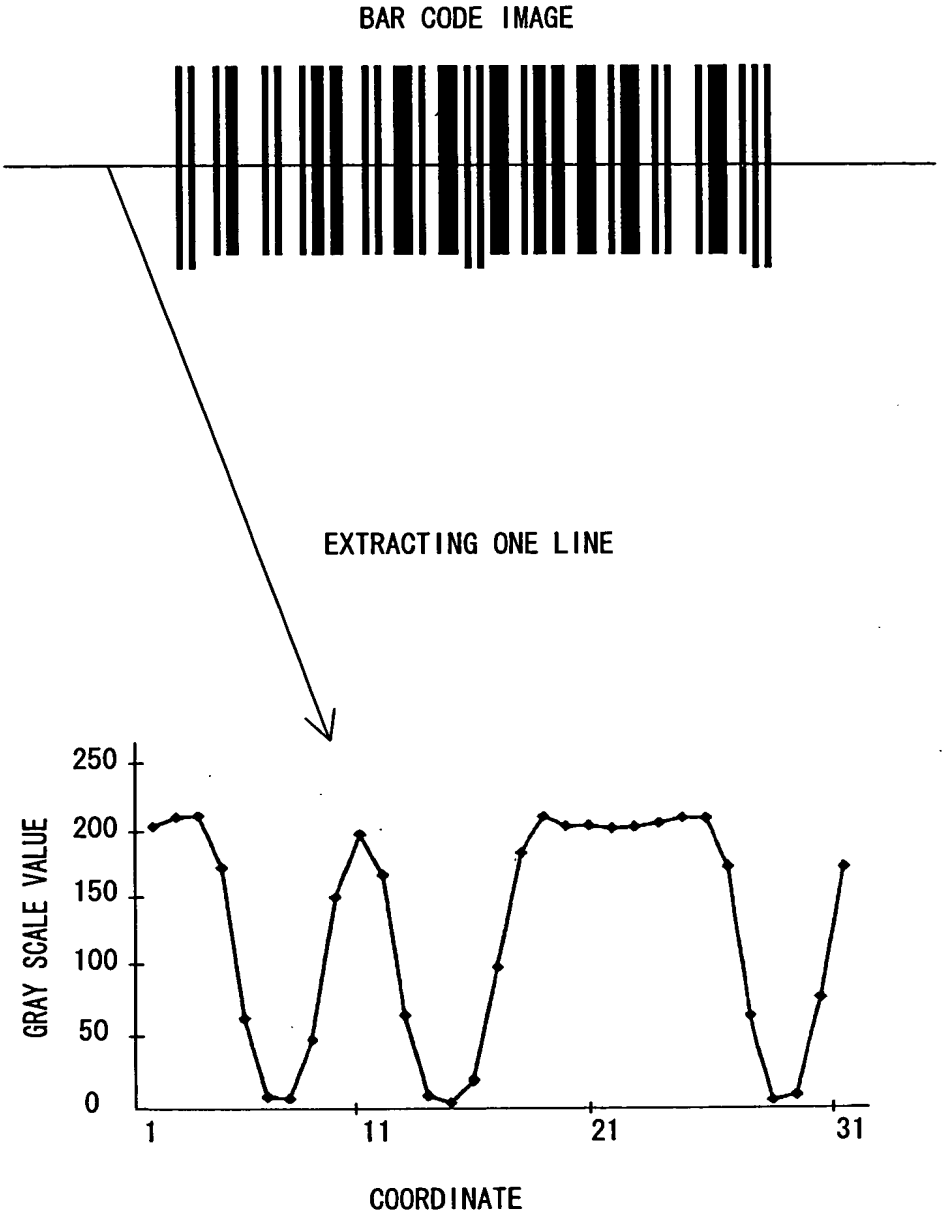

BAR CODE IMAGE
EXTRACTING ONE LINE
GRAY SCALE VALUE
250
200
150
100
50
0
1
11
21
31
COORDINATE

FIG. 4

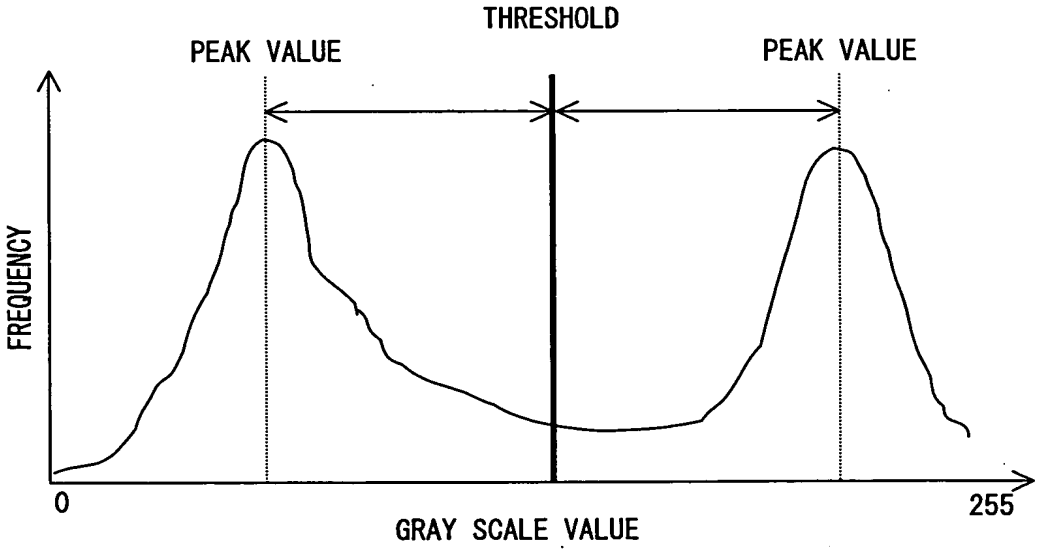

THRESHOLD
PEAK VALUE
PEAK VALUE
FREQUENCY
0
255
GRAY SCALE VALUE

FIG. 5

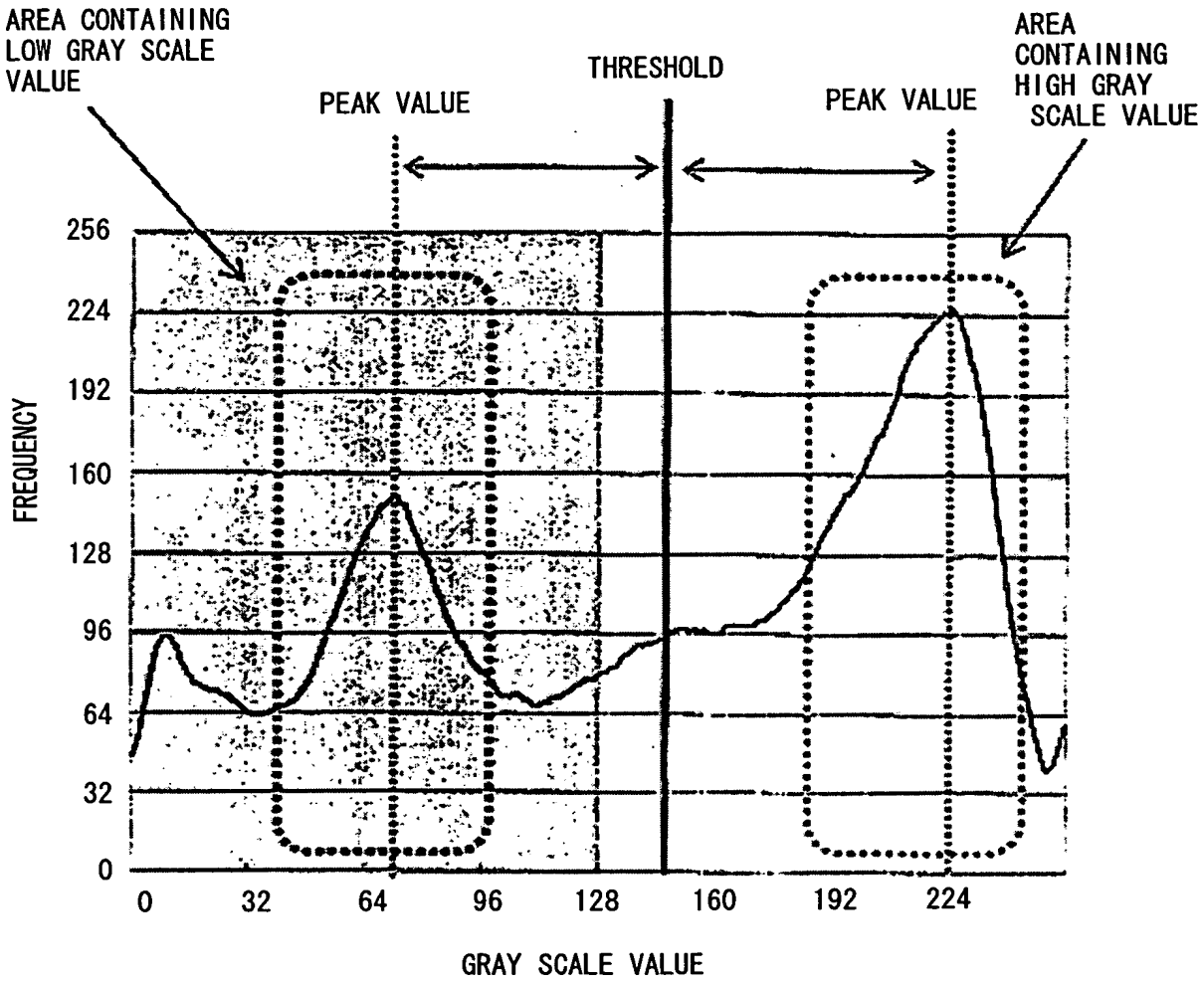

AREA CONTAINING LOW GRAY SCALE VALUE
PEAK VALUE
THRESHOLD
PEAK VALUE
AREA CONTAINING HIGH GRAY SCALE VALUE
FREQUENCY
256
224
192
160
128
96
64
32
0
0
32
64
96
128
160
192
224
GRAY SCALE VALUE

FIG. 6

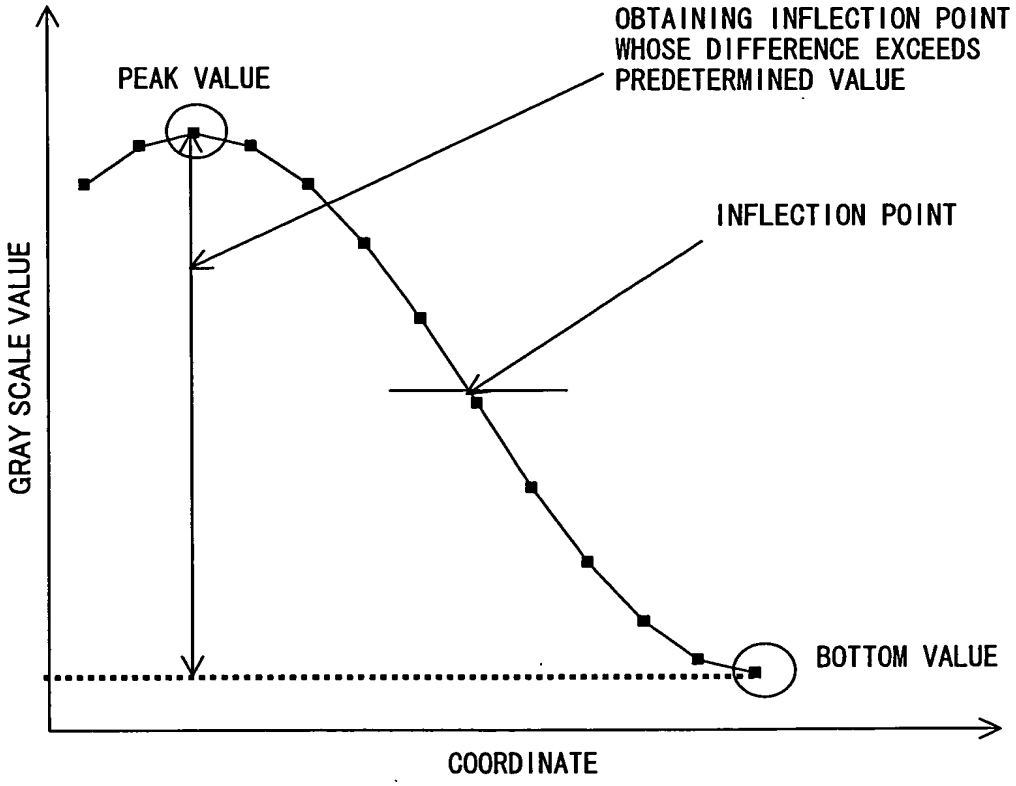

OBTAINING INFLECTION POINT
WHOSE DIFFERENCE EXCEEDS
PREDETERMINED VALUE
PEAK VALUE
INFLECTION POINT
GRAY SCALE VALUE
BOTTOM VALUE
COORDINATE

FIG. 7

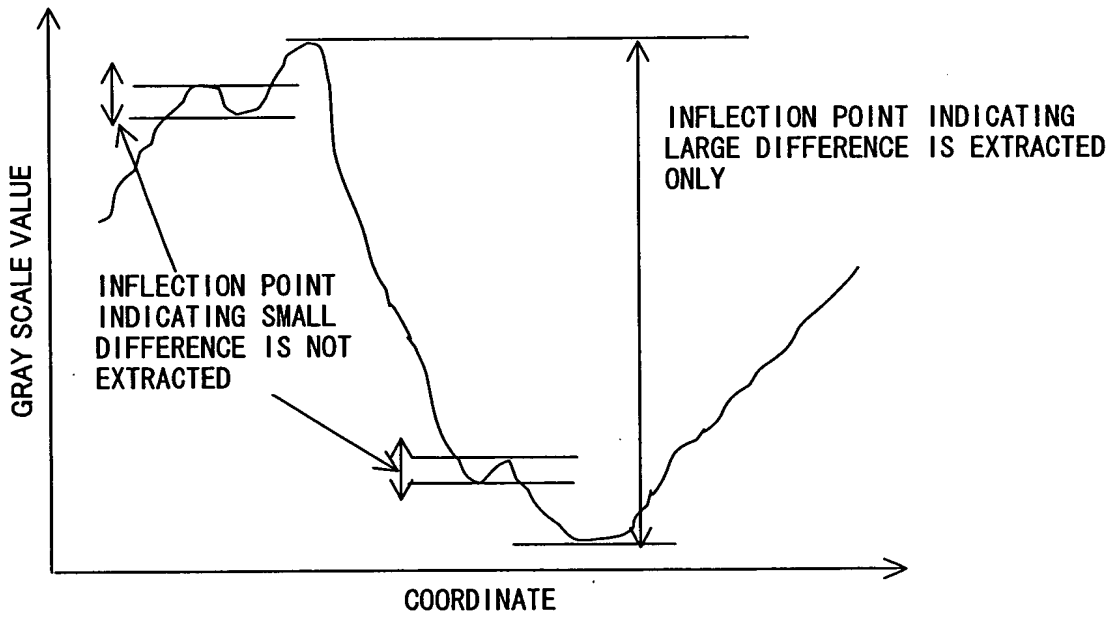

GRAY SCALE VALUE
COORDINATE
INFLECTION POINT INDICATING LARGE DIFFERENCE IS EXTRACTED ONLY
INFLECTION POINT INDICATING SMALL DIFFERENCE IS NOT EXTRACTED

FIG. 8

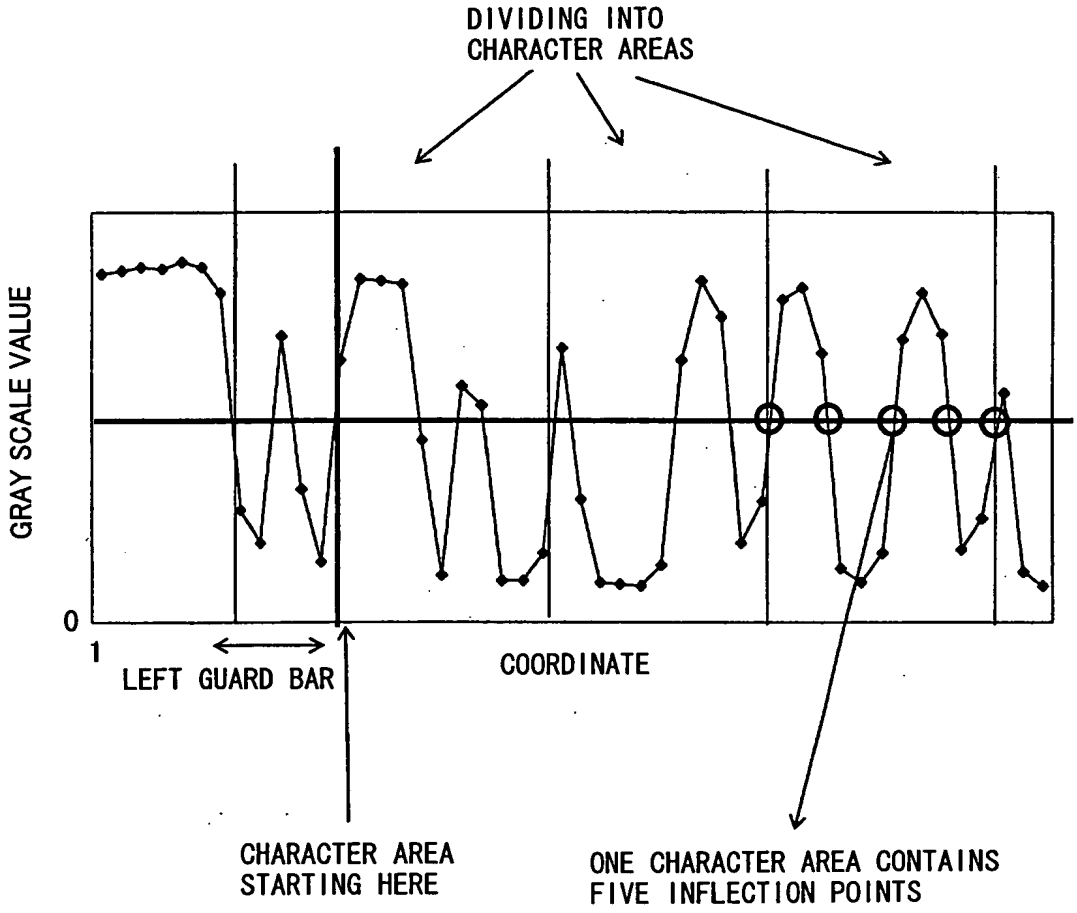

DIVIDING INTO
CHARACTER AREAS
GRAY SCALE VALUE
0
1
LEFT GUARD BAR
COORDINATE
CHARACTER AREA
STARTING HERE
ONE CHARACTER AREA CONTAINS
FIVE INFLECTION POINTS

FIG. 9

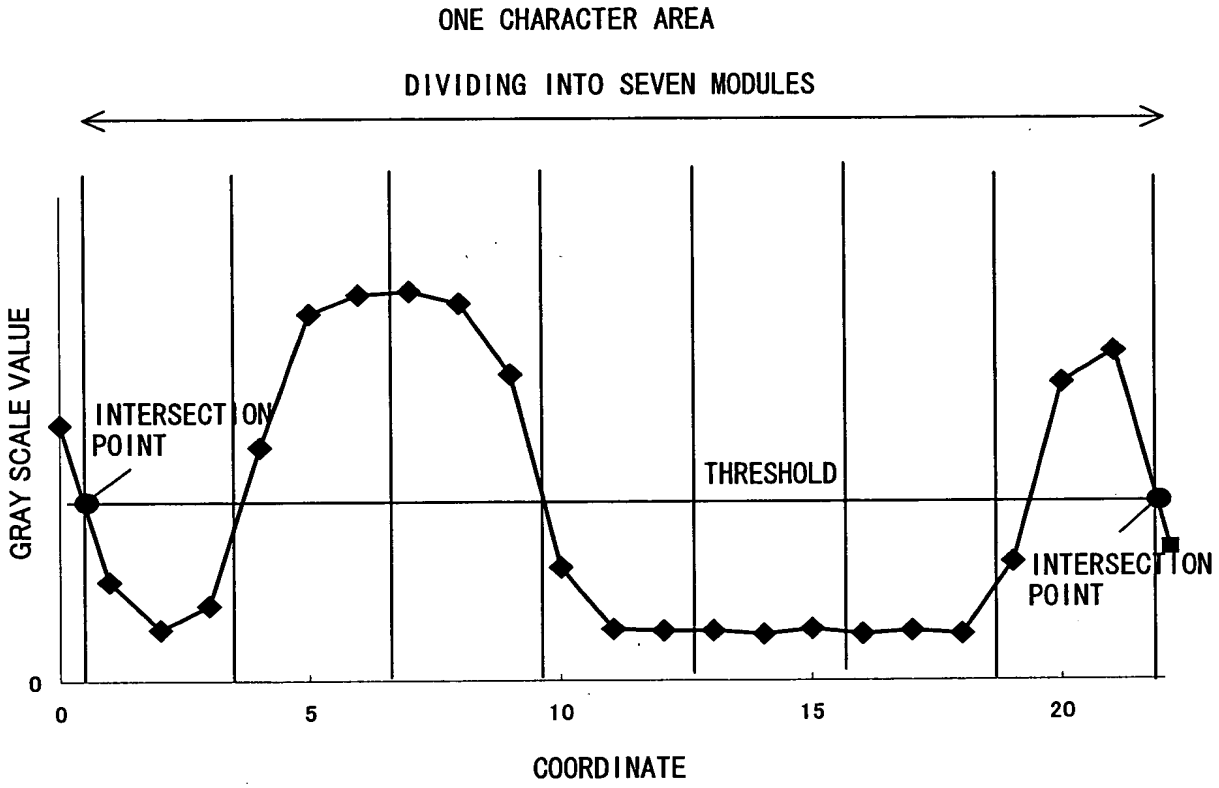

ONE CHARACTER AREA
DIVIDING INTO SEVEN MODULES
GRAY SCALE VALUE
INTERSECTION POINT
THRESHOLD
INTERSECTION POINT
0
0
5
10
15
20
COORDINATE

FIG. 10

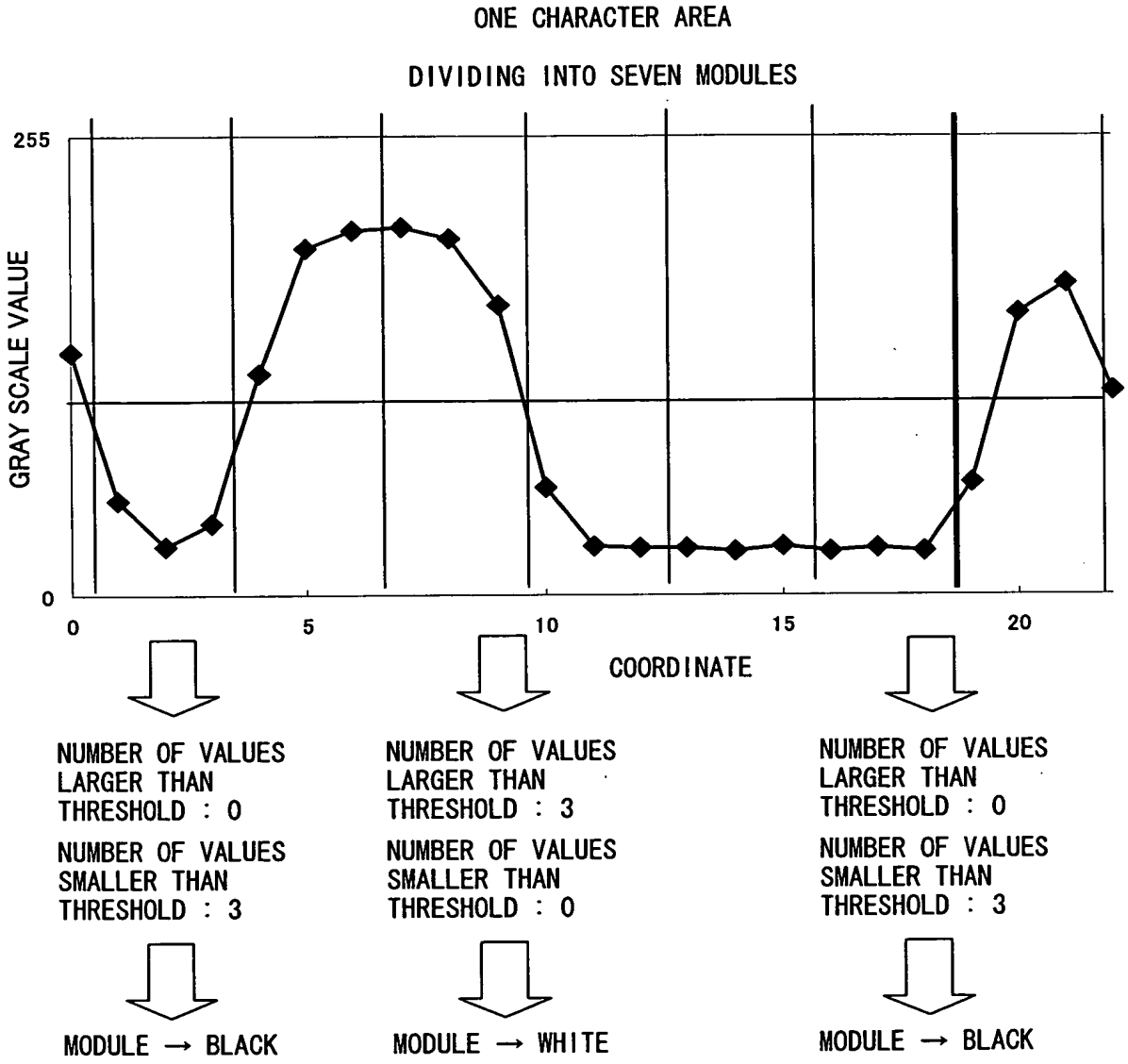

ONE CHARACTER AREA
DIVIDING INTO SEVEN MODULES
255
0
GRAY SCALE VALUE
0
5
10
15
20
COORDINATE
NUMBER OF VALUES LARGER THAN THRESHOLD : 0
NUMBER OF VALUES SMALLER THAN THRESHOLD : 3
MODULE → BLACK
NUMBER OF VALUES LARGER THAN THRESHOLD : 3
NUMBER OF VALUES SMALLER THAN THRESHOLD : 0
MODULE → WHITE
NUMBER OF VALUES LARGER THAN THRESHOLD : 0
NUMBER OF VALUES SMALLER THAN THRESHOLD : 3
MODULE → BLACK

FIG. 11

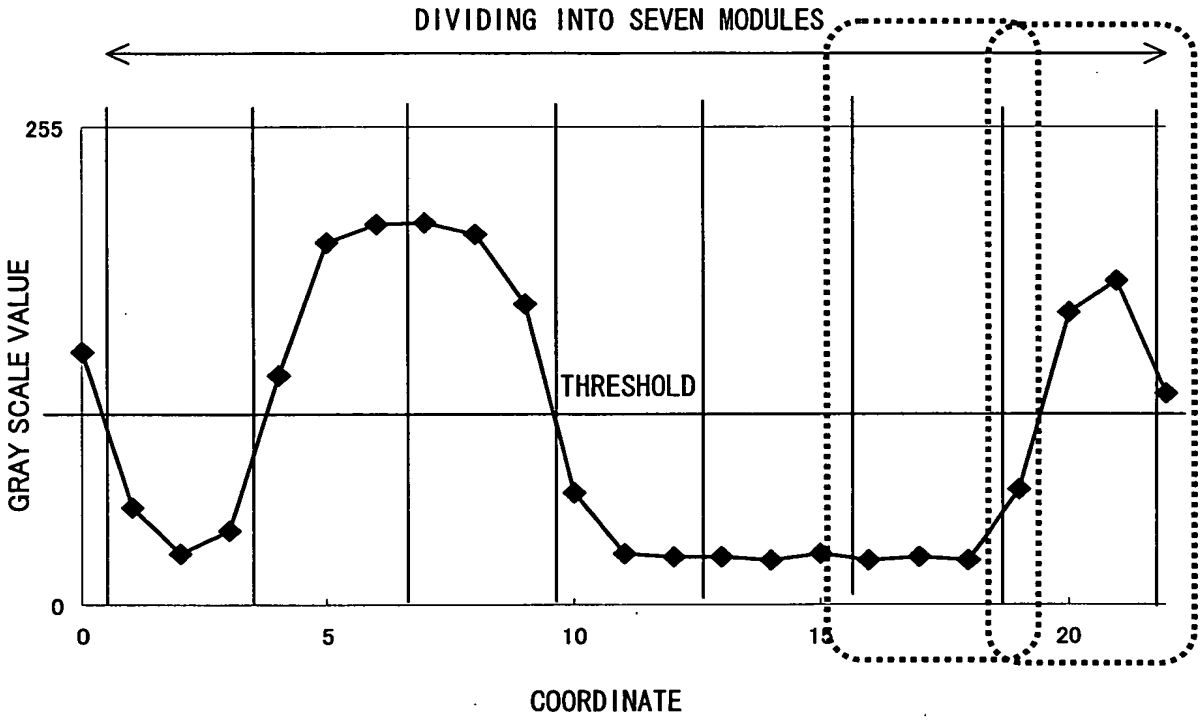
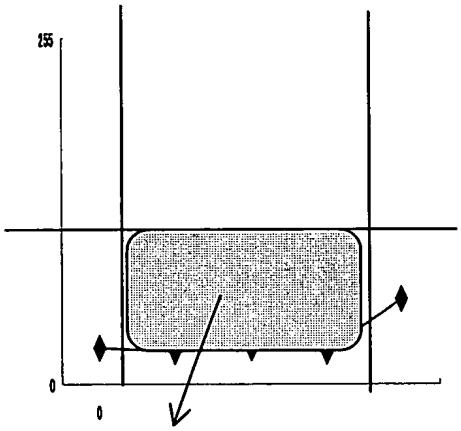

DIVIDING INTO SEVEN MODULES
255
0
GRAY SCALE VALUE
THRESHOLD
0
5
10
15
20
COORDINATE

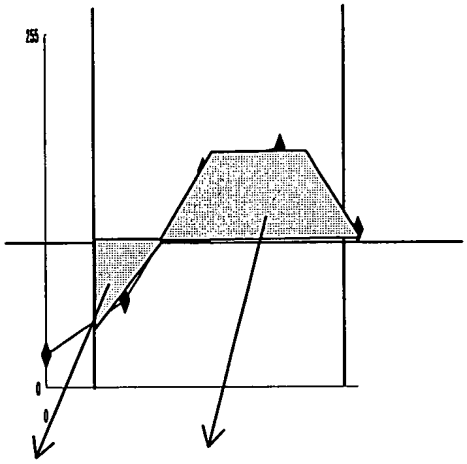
FIG. 12



AREA ABOVE THRESHOLD (=0) <
AREA BELOW THRESHOLD

MODULE → BLACK

(A) SIXTH MODULE



AREA ABOVE THRESHOLD >
AREA BELOW THRESHOLD

MODULE → WHITE

(B) SEVENTH MODULE

FIG. 13

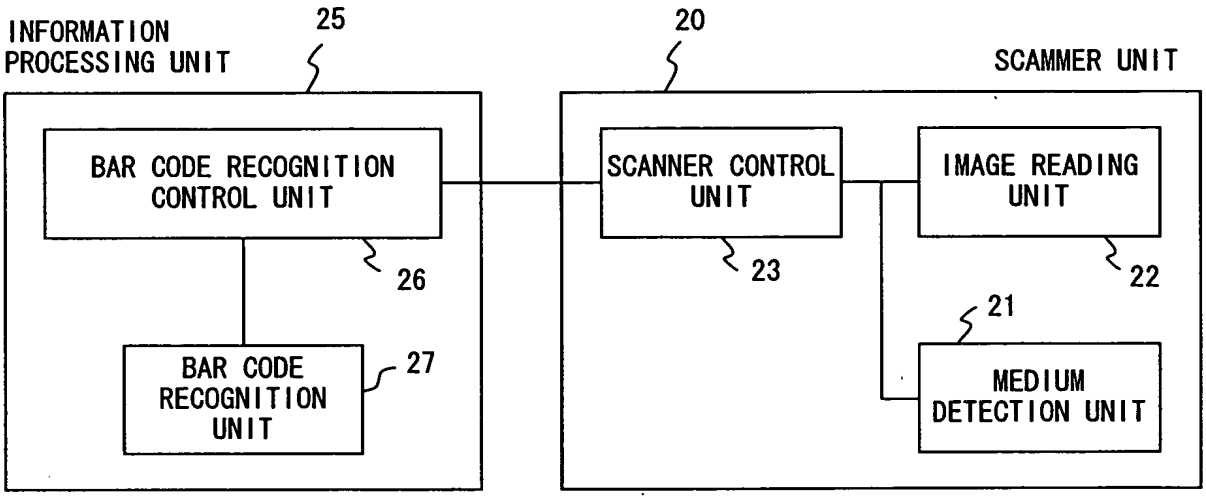

INFORMATION PROCESSING UNIT
25
20
SCAMMER UNIT
BAR CODE RECOGNITION CONTROL UNIT
26
SCANNER CONTROL UNIT
23
IMAGE READING UNIT
22
21
BAR CODE RECOGNITION UNIT
27
MEDIUM DETECTION UNIT

FIG. 14

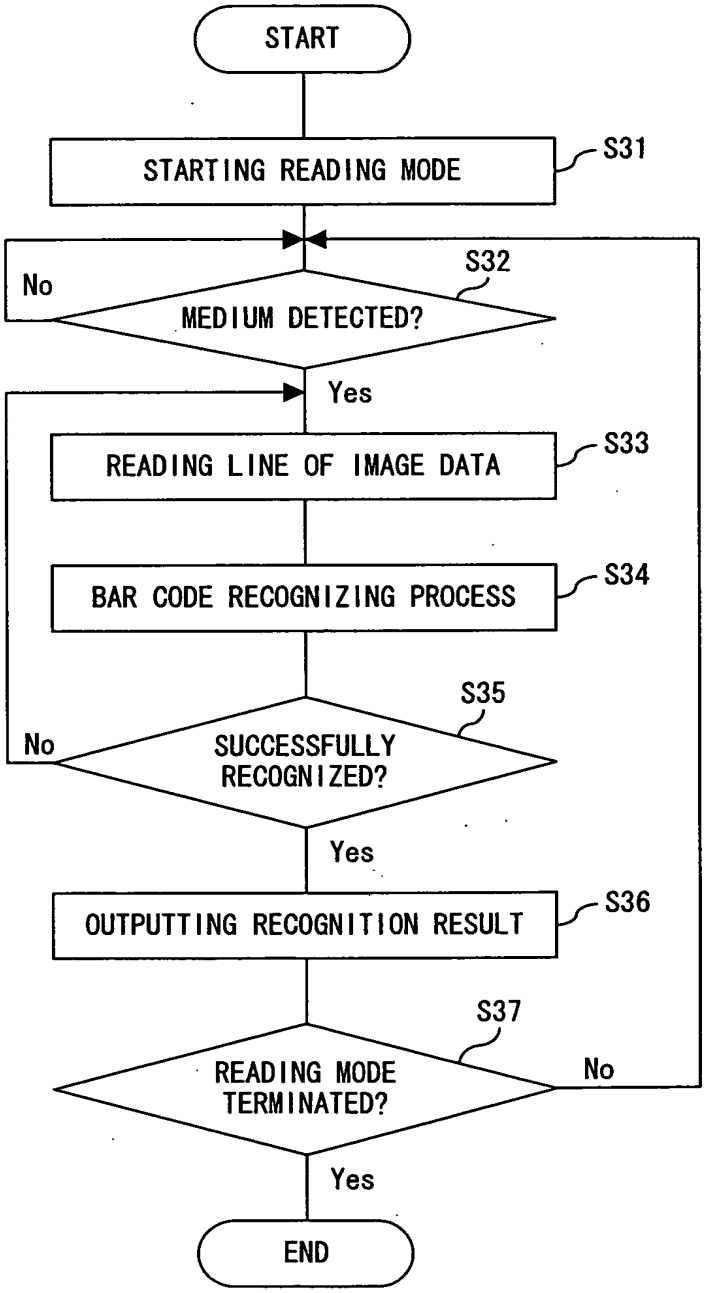
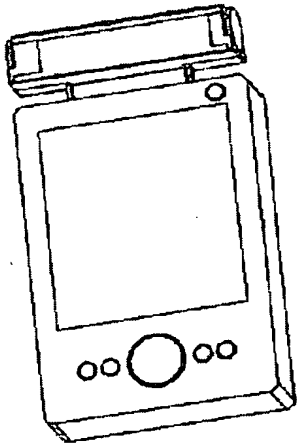

START
STARTING READING MODE
S31
S32
No
MEDIUM DETECTED?
Yes
READING LINE OF IMAGE DATA
S33
BAR CODE RECOGNIZING PROCESS
S34
S35
No
SUCCESSFULLY RECOGNIZED?
Yes
OUTPUTTING RECOGNITION RESULT
S36
S37
READING MODE TERMINATED?
No
Yes
END

FIG. 15



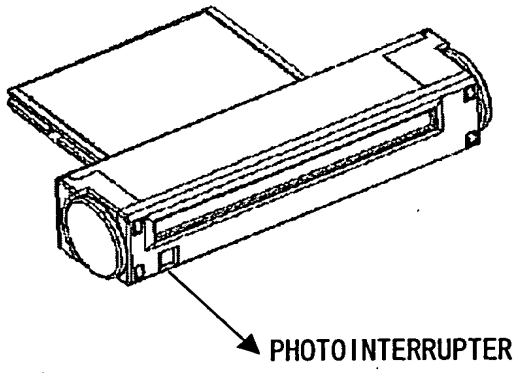


FIG. 16

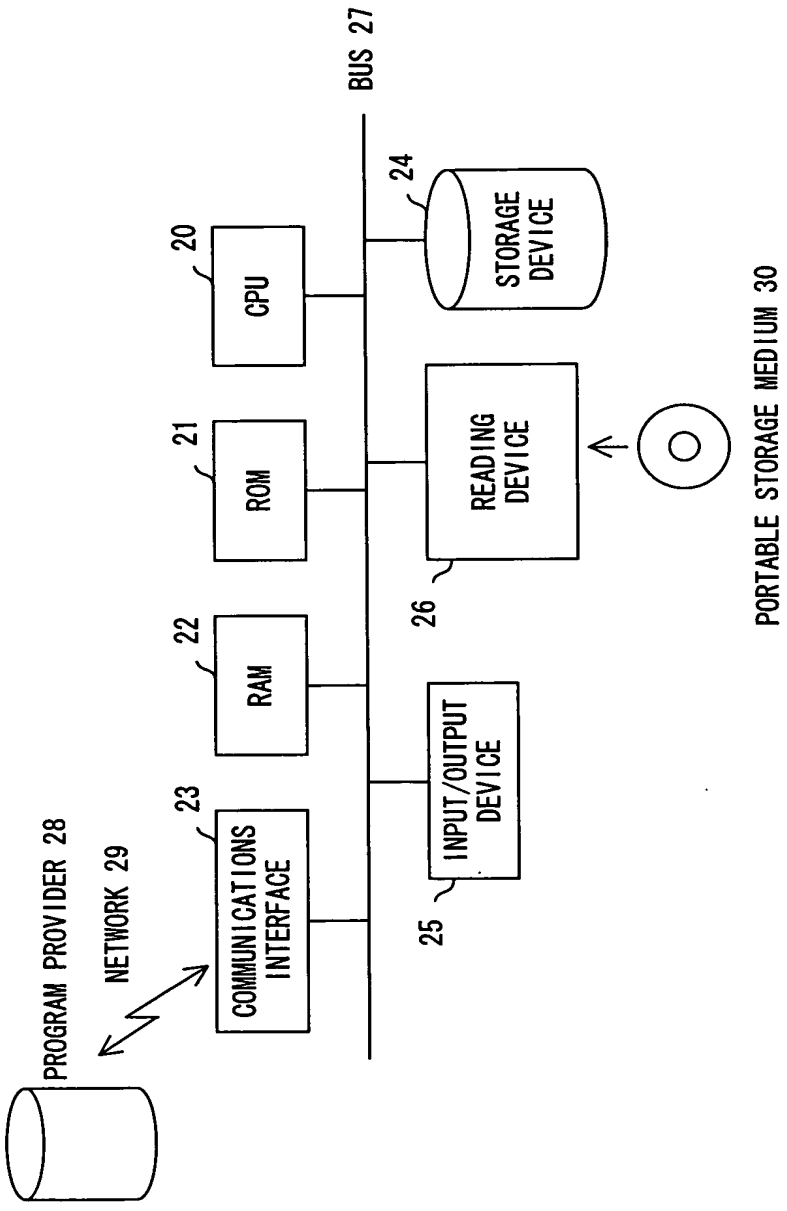

BUS 27
20
CPU
21
ROM
22
RAM
23
COMMUNICATIONS INTERFACE
24
STORAGE DEVICE
26
READING DEVICE
25
INPUT/OUTPUT DEVICE
PORTABLE STORAGE MEDIUM 30
PROGRAM PROVIDER 28
NETWORK 29

FIG. 17